

Shorter Contributions

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A COLLECTION OF SHREWS FROM FORESTS IN FRANKLIN COUNTY, VIRGINIA. — In Virginia, shrews (Soricidae) have been the subject of a number of localized studies (Linzey, 1998), but there is still limited knowledge about their abundance and distribution in many portions of the state. Shrews are common in forest habitats throughout Virginia, although they tend to increase in diversity in cool, moist forests at high elevations (Ford et al., 2006). The abundance and diversity of shrews has been associated with invertebrate abundance, and moist soil and forest leaf litter (Getz, 1961; Kirkland, 1991).

In Franklin County, there is little published information about shrew populations. The county lies within the transition zone between the Piedmont and Blue Ridge Mountain physiographic provinces, which also corresponds to the transition zone between the distributions of some shrew species. General reports and texts about the shrews in Virginia (Pagels et al., 1985; Webster et al., 1985; Linzey, 1998) are often based on incomplete information and new data would be useful in refining the distribution of shrew populations in the state.

Shrews are often difficult to identify due to their small size and similar external appearance (Webster et al., 1985) and distinguishing some species often requires close examination of their teeth. They are also cryptic in their habits and difficult to collect without labor- and time-intensive pitfall trapping (Ford et al., 2006). We took advantage of different pitfall trapping studies at and near Ferrum College in Franklin County which incidentally captured shrews. Due to their sensitivity to stress (Linzey, 1998), shrews often die in pitfall traps. We collected these dead shrews to make detailed measurements for species identification and to determine the relative abundance of each species in forest habitats at three sampling sites in Franklin County.

Shrews were collected using plastic silt fence drift fall arrays with pitfall traps ranging in size from 10-17 L. Three arrays were established at each of two sites with mature mixed-pine hardwood forests, one at Ferrum College and the other on a private property located approximately 1 mile from the college. There were six arrays in mixed pine-hardwood forest, three arrays at each of two sites. These arrays were arranged in the form of a "+" with five 17-L pitfall traps (one in the center and four at the ends of 5 m long silt fences). Silt fences were 50 cm tall and fastened to the ground

with landscape pins to prevent animals from passing under the fences. Forests were dominated by oaks (*Quercus* spp.), Red Maple (*Acer rubrum*), Tuliptree (*Liriodendron tulipifera*), and White Pine (*Pinus strobus*). An additional array was established along the forested border of Chapman Pond at Ferrum College. This array was linear in shape and included three 10-L pitfall traps along a 25 m fence with one trap in the middle and the other two near the opposite ends of the fence. Pitfall traps were smaller in this array because the water table was near the surface. Sampling occurred from June-September 2013 and during June 2014.

Live shrews were identified to species and released. Dead shrews were collected from pitfall traps on a daily basis during the sampling periods. If they were dry and intact, shrews were measured for total body length (including tail), tail length, hind foot length, and body mass. In addition, pelage and tail coloration and dentition were examined in order to identify shrews using the key developed by Linzey (1998). All captured shrews were numbered and frozen for a voucher collection located at Ferrum College.

We captured five species of shrews in our pitfall arrays, including 26 Pygmy Shrews (*Sorex hoyi*), 10 Smoky Shrews (*Sorex fumeus*), one Southeastern Shrew (*Sorex longirostris*), three Least Shrews (*Cryptotis parva*), and 14 Northern Short-tailed Shrews (*Blarina brevicauda*) (Table 1). The Pygmy Shrew was the most abundant species captured and occurred at all study sites. Morphometric data for this species (Table 1) corresponded closely with the description in Linzey (1998), as did the arrangement of unicuspid teeth. This shrew was once considered rare in Virginia (Webster et al., 1985), but it has since been found to be widely distributed throughout the state (Linzey, 1998).

We distinguished the Northern Short-tailed Shrew, the second most frequently captured species at our study sites, from the similar Southern Short-tailed Shrew (*Blarina carolinensis*) mostly based on geographic location (Webster et al., 1985; Linzey, 1998). Linzey's (1998) key separates these species primarily on body size and hind foot length, but our measurements overlap the cited ranges of these measurements for both species (Table 1). The Northern Short-tailed Shrew is the larger of the two species, but some individuals that we captured may not have been full-grown adults. Identification of these two species is considered to be difficult where their ranges overlap in eastern Virginia (Webster et al., 1985).

The Smoky Shrew is also difficult to distinguish from the Southeastern Shrew, except for the larger size of the former. Some of our total body size

Table 1. Morphological characteristics (means and ranges) of shrews collected in forests of Franklin County, Virginia.

Species	Total Length (cm)	Tail Length (cm)	Hind Foot Length (cm)	Weight (g)
<i>Blarina brevicauda</i> (n = 14)	9.58 (8.3-10.8)	2.21 (2.0-2.5)	1.32 (1.1-1.5)	12.46 (9.3-14.5)
<i>Cryptotis parva</i> (n = 3)	6.43 (5.8-7.0)	1.60 (1.3-2.0)	0.70 (0.6-0.8)	3.83 (3.6-4.0)
<i>Sorex fumeus</i> (n = 10)	9.64 (8.1-10.6)	4.01 (3.4-4.5)	1.20 (1.0-1.3)	6.46 (4.5-8.7)
<i>Sorex hoyi</i> (n = 26)	6.69 (4.3-7.8)	2.64 (2.0-3.2)	0.78 (0.6-0.9)	2.34 (1.7-3.1)
<i>Sorex longirostris</i> (n = 1)	10.3	3.8	1.1	7.2

measurements are less than the lower range limit in Linzey's (1998) key, but, again, some of our captures could have included subadult shrews. Our identification was mainly based on dentition, and supported by pelage color and the extent of tail bicoloration. Smoky Shrews have reportedly been captured previously in Virginia only at elevations higher than 610 m (Linzey, 1998), but the elevations of our study sites are lower (ca. 440 m). Habitat characteristics of our study sites, however, are more favorable for the Smoky Shrew which prefers moist forest habitats with thick leaf litter (Webster et al., 1985). The Southeastern Shrew prefers thick understory vegetation, particularly those with vine tangles (Webster et al., 1985) which do not occur at our study sites and they are also reported to prefer disturbed habitats (VDGIF, 2014).

Finally, we recorded one Least Shrew at each of our three study sites. The species is thought to prefer grassy fields, rather than the older forests characteristic of our study sites (Linzey, 1998). Pagels et al. (1992) captured this species mostly in clearcuts, but also less frequently in 40-year-old mixed pine-hardwood forests in the Virginia Piedmont.

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